

Subcommittee on Research and Commercialization

The Subcommittee makes the following observations and conclusions about Research and Commercialization activities performed by South Dakota state government:

1. The committee maintains that the Legislature should be an integral player in future discussions and planning involving the state's research activities and eventual commercialization development activities.
2. With the continual changes in the legislature and legislative staff, it is imperative to keep planning documents updated and accessible to those in the Legislature and their staff.
3. The attached documents are important "living" documents and should be updated by the appropriate entities.
 - a. "A 2010 Vision, The Future of Research and Technology in South Dakota, A State Plan" dated February 8, 2006
 - b. CEO (Creating Entrepreneurial Opportunities) Program Issue Brief No. 3 – January 2006 originally published by GOED
 - c. "2010 Initiative Research Centers' Report" dated December 6, 2005
 - d. "Quantitative Expectations for External Funding and Commercialization" dated February 15, 2006

A 2010 Vision, The Future of Research and Technology in South Dakota, A State Plan

February 8, 2006

Introduction

The vision is for SD to be a recognized research leader in focused areas building upon the states resources and to support achievement of the South Dakota 2010 Initiative and The Governor's 2010 Education Initiative. These two initiatives provide the impetus for investing in focused research and development, building infrastructure to support an innovation-driven economy, commercialization of intellectual property, building a highly skilled technical work force based on a focused K-20 educational strategy, and stimulating an entrepreneurial culture throughout the state.

The South Dakota Research and Technology Vision Statement establishes the strategic vision for South Dakota to become a leader in focused research areas and technology based economic development. South Dakota has historically been an agricultural and natural resource based economy and also has experienced an out migration of its educated young people. South Dakota has traditionally followed a cost and commodity driven model of economic growth but needs to transition into an innovation-driven economy creating value through increased productivity and new products and services sold globally.

In the fall of 2003 Governor Michael Rounds announced the 2010 Initiative outlining a series of specific goals for economic growth and visitor spending in SD by the year 2010. The 2010 Initiative is intended to result in an unprecedented era of opportunity and economic development for SD. The five 2010 Initiative goals are: Goal One: Double Visitor Spending from \$600 Million to \$1.2 Billion by 2010, Goal Two: Increase Gross State Product by \$10 Billion by 2010, Goal Three: Become a Recognized Leader in Research and Technology Development by 2010, Goal Four: Brand and Develop South Dakota's Quality of Life as the Best in America by 2010, and Goal Five: Uphold Our Commitment to the 2010 Initiative as a Work in Progress.

The development and implementation of a State Research and Technology 2010 Vision is intended to support the 2010 Initiative and provide a broad context to research and technology development in the state. As with the 2010 Initiative the State Research and Technology 2010 Vision focuses on opportunities that are achievable in 10 to 20 years with shorter term 2010 milestones, builds on the assets of the state, and benefits companies, communities, people and places. The innovation-driven economy of the 21st Century is not a new set of industries but rather about competing in fundamentally different ways. It is about applying innovative new ways of doing things to a wide range of products, services and sectors. Companies and organizations must continuously innovate to provide better products and services faster than the competition.

South Dakota can and must join the innovation-driven economy. Positive long-term economic development, job creation and retention of the state's well-educated young people simply will not happen without research and technology based economic development. Technology-based economic development has been shown to grow at a rate several times faster than the aggregate economy.

The State Research and Technology 2010 Vision establishes a long-range framework for the state's research and education activities to develop significant forward looking sectors that compete on innovation and serve state, national and international markets. The development of a portfolio of these industrial sectors will provide opportunities for more people to earn a higher standard of living. The outcomes and actions outlined in this vision statement are appropriately aligned with the 2010 Initiative Goal 3. In the next five to ten years, if we are able to: make the Deep Underground Science and Engineering Laboratory (DUSEL) at Homestake (both at the state supported interim 4850' level and ultimately an NSF supported laboratory at a much deeper depth); expand the number of Ph.D. programs, postdoctorates and graduate students at the state's universities, especially in the planned research focus areas; build on existing research capabilities at the universities, EROS, the private sector and elsewhere; and aggressively create an entrepreneurial culture that fosters innovation, we will be on our way towards fulfilling the 2010 Vision for Research and Technology in SD. The state's comprehensive research universities have a solid base of research accomplishment and many distinguished faculty members play important roles in helping set national research agendas. This record of achievement provides a strong research foundation for the Regental system to play a key role in advancing the strategy to substantially expand future research and development efforts in SD. The next step is to establish a process for stake holders for determining specific actions to be taken and establish metrics and evaluation procedures. The strategic plans formulated in response to the 2010 Vision will be updated through a process involving key research and technology stakeholders and policy-makers. Substantial state government, community and business financial support will be necessary to accomplish this vision. Private sector business involvement will be a key component of future success as any endeavor must be market driven.

2010 Vision for the State of South Dakota

OUTCOME ONE: Become a Recognized Leader in Research and Development by 2010

The vision is for SD to be a recognized research leader in focused areas building upon the states resources and to support achievement of the South Dakota 2010 Initiative and The Governor's 2010 Education Initiative. These two initiatives provide the impetus for investing in focused research and development, building infrastructure to support an innovation-driven economy, commercialization of intellectual property, building a highly skilled technical work force based on a focused K-20 educational strategy, and stimulating an entrepreneurial culture throughout the state.

South Dakota is a good place to start a business and most innovative technical development is developed and commercialized by start-up businesses. To capitalize on the state's business friendly environment, technology based entrepreneurship will be integrated into

the state's education and economic development plans. As part of the 2010 Initiative the state of South Dakota is implementing the Creating Entrepreneurial Opportunities (CEO) program. The CEO program has been designed to support all of the 2010 Goals and commercialization of innovations and technology by entrepreneurs and existing South Dakota businesses in all areas. The Action Items for accomplishing the objectives for Goals One to Six are shown in Attachment I.

OUTCOME TWO: Make Technology Based Economic Development a Focus of Economic Development Efforts

The Creating Entrepreneurial Opportunities (CEO) program through education, outreach, and networking activities will create an environment supportive of innovation and technology based economic development. The CEO program involves universities, communities, private industry and other entities working together to develop long-term public/private research and commercialization relationships that promote innovation and build upon the strengths of the partners. A strategic plan that is synergistic with university research strategic plans, academic programs, the regions'/partners' strengths, and identified opportunities will be developed by each CEO Center. CEO Centers will be located throughout the state at universities, tribal colleges, technical institutes and technology business incubators. The CEO Centers will be a collaborative effort involving the Department of Tourism and State Development, universities, industry partners, incubators, communities, K-12 schools, business assistance service providers and private sector partners. The CEO Centers will link entrepreneurs with business service providers and develop entrepreneurship support networks including angel investors, mentors, potential business management team members and other science/technology based economic development infrastructure.

OUTCOME THREE: Nurture Entrepreneurs through the State's Education System

The SD Department of Tourism and State Development, Department of Education, and Board of Regents will work with universities, technical institutes, K-12 schools, business incubators and private sector partners such as Junior Achievement to create an environment that encourages and supports research/technology innovation and entrepreneurship throughout the state. The objective of the Research/Technology Innovation and Entrepreneurship program will be to expose, encourage and prepare South Dakotan's of all ages to pursue innovation based opportunities.

OUTCOME FOUR: Incubate and Grow Innovative Entrepreneurial Companies

The combination of competitive research programs within higher education and the private sector and a culture of innovation and entrepreneurship will result in the expansion of existing industries and development of new businesses throughout SD. The CEO Centers and participating service providers will help to identify, evaluate and develop science and technology business ideas where the scientist, engineer or entrepreneur can be partnered with mentors and business management partners needed to attract the financing enabling the launching of new businesses. Local, regional, and statewide entrepreneurship support networks need to be developed and linked with national and international networks of researchers and entrepreneurs that will allow SD entrepreneurs to effectively compete in the innovation-driven economy.

OUTCOME FIVE: Invest in Diverse Sources of Risk Capital

The Governor's Office of Economic Development will work with entrepreneurial networks to support the development of angel investor networks, expand venture capital resources in SD, work with financial institutions on debt financing programs, and develop a variety of financing options to meet the needs of entrepreneurs. Financing programs must range from the Small Business Innovation Research (SBIR) Phase 0 program assisting science and technology entrepreneurs to successfully obtain early stage risk capital through the SBIR Phase I and II program, to venture capital funding or debt financing to grow the business as appropriate. It is critical that a range of flexible financing programs are available to enable existing businesses and entrepreneur teams to obtain the capital necessary for their innovative companies to grow and prosper in SD.

OUTCOME SIX: Align K-12's Educational Standards and Expectations with the Knowledge and Skills Essential for Research and Technology-based Economic Development

The creation of an innovative and entrepreneurial environment (science & technology-based economic development) has as its very foundation a vibrant K-12 education sector. Strong K-12 mathematics and science education programs and standards will lead to the development of future generations of scientists and engineers who will become technology entrepreneurs and thereby enable South Dakota to compete in the innovation-driven economy of the 21st century.

ACTION ITEMS

OUTCOME ONE:

- The SD Science and Technology Authority will be supported in implementing and sustaining its business plan to develop the deep underground science and engineering laboratory initially at the 4850' level and ultimately the NSF supported DUSEL. Develop strategies that allow the entire state to support and benefit from the investment in the laboratory.
- Emerging areas and current research enterprises that are critical to a state-wide technology based economy will be pursued independently and collaboratively by researchers at the state's institutions of higher education and industry partners. These fields include: materials science and engineering; biotechnology, including bioprocessing, biofuels and biomedical; information technology and assurance; agricultural sciences; and medical and health sciences and technology development.
- South Dakota's Regental system and universities will establish procedures to strategically hire tenure-track and research faculty in senior leadership and entry-level positions to support the research focus areas undertaken in this plan.
- Strong collaborative research programs with the USGS EROS Center, the proposed NSF DUSEL at Homestake and other national laboratories will be developed.
- Strong doctoral programs in areas that are critical to the planned research focus areas and that encourage innovation and entrepreneurship will be developed.
- The 2010 Initiative Research Centers will become sustainable Centers of research excellence and contribute to the state's economic development.
- DOE/DOD/NASA/NSF EPSCoR and NIH IDeA/COBRE infrastructure programs will be coordinated to maximize the positive impact on higher education's and industry infrastructure development in support of the 2010 Initiative.
- The number of patents and other intellectual property entities from both the private sector and higher education and commercialization of those innovations will be increased.
- Collaborative research efforts between private business, higher education, federal and state agencies and health care providers will be fostered.

- Higher education degree programs will be strengthened by creating opportunities for more interdisciplinary and inter-institutional participation in research and internship activities with industry partners at undergraduate and graduate levels.
- South Dakota businesses will be encouraged to increase research and development activities.

OUTCOME TWO:

- CEO Centers will be established in the state to facilitate universities, economic development organizations, industry and community partnerships to support knowledge based high impact entrepreneurs, business expansion and recruitment.

OUTCOME THREE:

- Develop SD Research/Technology Innovation and Entrepreneur outreach programs to K-12 schools and communities using the Dakota Digital Network and methods.
- Teacher education students at the state universities, private colleges and tribal colleges will work with the SD Junior Achievement and other educational outreach programs to develop curriculum modules, after school activities and other outreach programs focusing on discovery, innovation and entrepreneurship. The modules will focus on generating excitement for scientific discovery, innovation, and entrepreneurship.
- Provide innovation and entrepreneurship columns in college newspapers and development of student organizations supporting science and technology based entrepreneurship on campuses.
- Develop science and technology entrepreneurship experiences including, internships, summer research and entrepreneurship experiences, innovation and entrepreneurship teams.

OUTCOME FOUR:

- Develop effective business incubator programs through the CEO program.
- Create High Performance Regions supporting economic development from growth from within and technology based business recruitment.

OUTCOME FIVE:

- Develop Regional Angel Investor Network (RAIN) funds throughout South Dakota.

OUTCOME SIX:

- The Department of Tourism and State Development and Board of Regents will work with the SD Secretary of Education to complete goals and action steps for 2010 E that promote increased participation in advanced mathematics and science classes by high school students.
- Complete an analysis of South Dakota's content standards verifying their consistency with knowledge and skills required for science and technology development in our State and in the global economy.
- Review the content and standards of the training for science and mathematics teachers.

The strategic plans developed in response to this 2010 Vision will be regularly updated through a process involving key research, education, technology, business and policy maker stakeholders.

Synopsis: The Homestake Underground Science and Engineering Laboratory, the state's 2010 research centers, and new doctoral programs are expanding South Dakota's research and development capacity. To fully benefit from these research and education investments, South Dakota must develop and attract technology entrepreneurs and technology-based companies to commercialize the innovations generated.

Becoming a Leader in Research and Entrepreneurship

Gov. Rounds' 2010 Initiative set goals for South Dakota to become a research leader in focused areas with commercial potential, while growing the gross state product through entrepreneurship and business start-ups. The four 2010 research centers funded by the 2004 Legislature have been very successful in generating external research funding (\$14 million) and inventions (16 disclosures) in the first 16 months of activity. These centers have been so successful that Gov. Rounds is requesting an additional \$1 million in the FY07 budget to establish one or two more.

Several communities—Aberdeen, Brookings, Madison, Rapid City, Sioux Falls, and Vermillion—have built business incubator facilities to provide space for entrepreneurs and attract start-up firms from other states. To fill these incubators with high-growth potential businesses it is critical that the state, universities, private-sector partners, and local communities work together to create an entrepreneurial environment in South Dakota. The Creating Entrepreneurial Opportunities (CEO) program would provide \$280,000 in state matching funds to economic development organizations that partner with universities to create programs supporting entrepreneurs and developing future entrepreneurs throughout the state.

What is CEO?

This matching program leverages community and university resources to make available at least \$840,000 for CEO. It will become a key component of state-supported research and development and technology-based economic development efforts.

Each CEO center will be led by an economic development partner and involve multiple communities and universities. They will develop an industry focused, regional or statewide approach to fostering technology-based and high-impact entrepreneurial activities, as well as recruitment of businesses and entrepreneurs in target industries. The CEO centers will not only strive to meet the unique needs of technology and high-impact start-up businesses, but also implement programs to develop entrepreneurial communities and programs. This will create the next generation of entrepreneurs that becomes the critical base of South Dakota's economy in the 21st century.

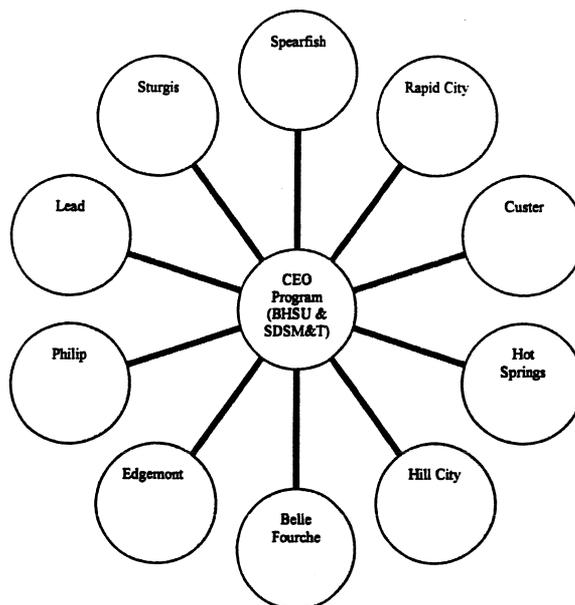
The Department of Tourism and State Development will seek proposals from economic development organizations that wish to partner with communities and universities to develop

CEO centers. Program funds will support three to four CEO coordinators serving as liaison between the state agency, universities, and community partners providing support for the CEO program activities.

CEO funding may be used for training volunteers to implement community entrepreneurship programs in partner communities, university-based technology entrepreneurship support programs, and incubator programs supporting technology and high-impact start-up businesses. Funding cannot be used for building construction, equipment, revolving loans, or equity investments. Applicants will be encouraged to model their plans on successful technology-based incubator and entrepreneurship programs. Examples of successful programs that might serve as models for the South Dakota CEO programs include:

- **E-City Program:** Case Western University and Cleveland communities and schools cooperated to develop a successful program to expose high school students to entrepreneurship as a career option and the importance of science and math education for success.
- **CEO Hinman Program:** University of Maryland has a premier student entrepreneur program where students form teams mentored by successful entrepreneurs, venture capitalists, researchers, and others to launch technology-based businesses. The teams live together, have office space in the incubator, and access to university laboratories.
- **High Performance Community Program:** The Center for the New West developed a program for communities wanting to succeed in the global economy, emphasizing growth from within.
- **Technology Business Incubator Program:** Leading incubator programs partner with private-sector partners to meet the needs of tenants such as legal, accounting, marketing, and financing. The incubators often receive equity in the start-up ventures in return for their services.
- **Entrepreneur and Start-Up Recruitment:** Entrepreneurial regions and successful technology-based incubators frequently have entrepreneurs and start-ups moving to the area to benefit from programs and a supportive environment. The Maryland Bio-Technology Business Incubator receives applications from throughout the world and accepts less than 10 percent of applicants.

Black Hills Vision Regional CEO Program Model



**South Dakota Department of Tourism and State Development
South Dakota Board of Regents**

**2010 Initiative Research Centers' Report
December 6, 2005**

To:

Interim Joint Appropriations Committee

From:

**James D. Hagen
Secretary, SD Department of Tourism & State Development**

**Robert T. Tad Perry
Executive Director, South Dakota Board of Regents**

**Daniel O. Farrington
System Vice President of Research, SD Board of Regents**

**Melvin Ustad
Director Commercialization, SD Department of Tourism &
State Development**

Attached find information concerning South Dakota Department of Tourism and State Development and South Dakota Board of Regents' 2010 Initiative Research Centers' Report as requested. Tad Perry will present the report on behalf of the Board of Regents and South Dakota Department of Tourism and State Development.

**South Dakota Department of Tourism and State Development
South Dakota Board of Regents**

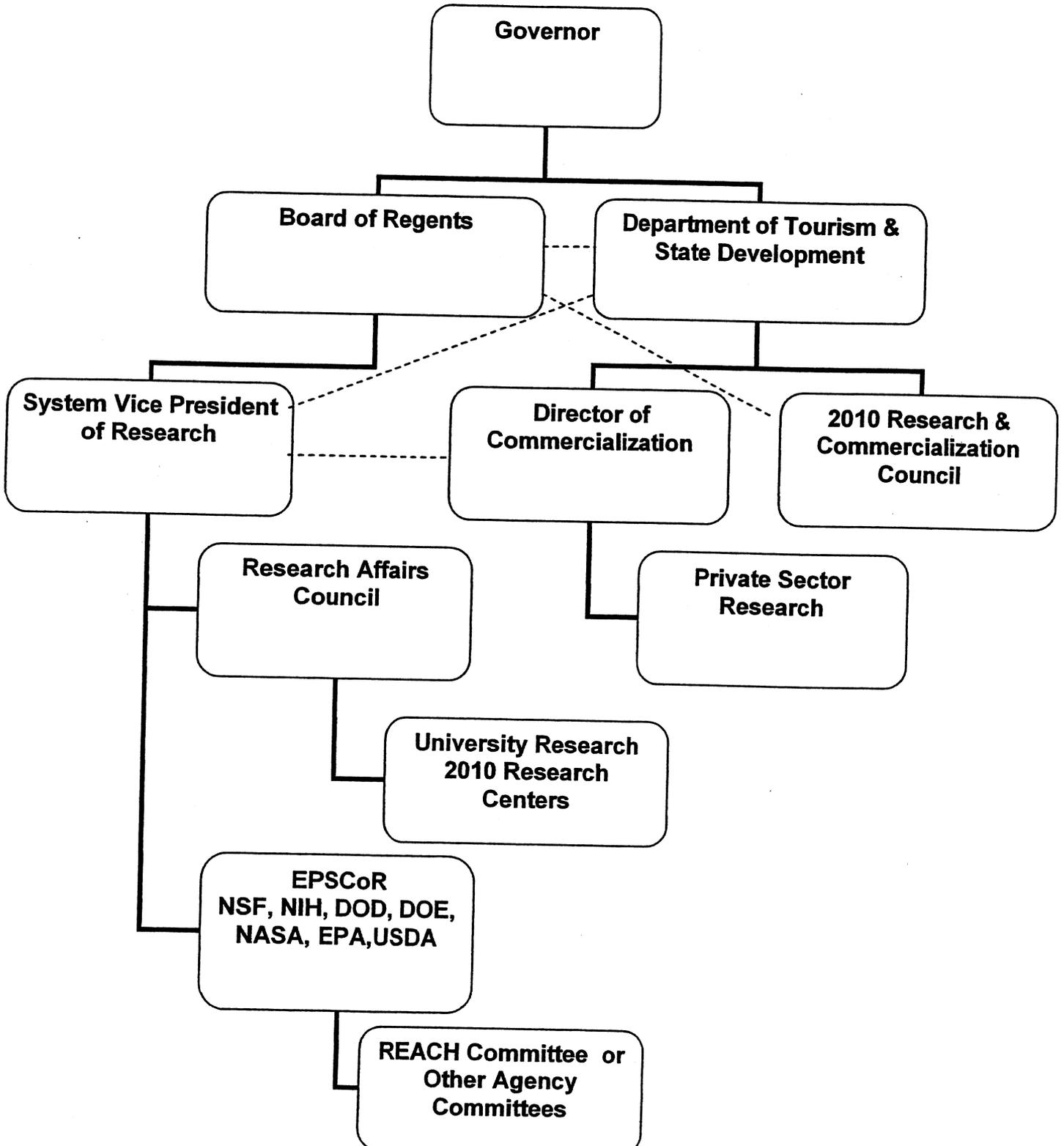
**2010 Initiative Research Centers' Report
December 6, 2005**

The 2004 Legislature appropriated \$3,715,861 in response to the Governor's 2010 research initiative. Approximately \$2.7 million of the appropriation was designated to develop four highly focused, highly competitive research centers within the Regental system. The centers have a focus on commercialization and are to become self-sustaining by year 6 or earlier through the acquisition of external grants and other funding including revenue from the commercialization of research results. The additional funds were used to establish a Board of Regents System Research Office, a Department of Tourism and State Development Commercialization Office and to provide \$600,000 NSF EPSCoR grant cost share. The Research and Commercialization relationships established as a result of the initiative are shown in Table 1.

The National Science Foundation EPSCoR Research Infrastructure Improvement (RII) Grant entitled; "The 2010 Initiative: Science Based Leadership for South Dakota" was submitted in September, 2005. The amount requested was \$9M with a \$2.4M appropriated state match spread over four years. A response from the NSF is expected early in 2006.

Table 1.

Governor's 2010 Research Initiative Relationships



The four 2010 Research Centers are now in their second year of operation. The Centers have a focus on technology based economic development in addition to becoming self-sustaining through the acquisition of external funds. The Centers are making excellent progress in meeting their external funding and sustainability strategic plans. A second year of funding for the Centers was approved by the 2010 Research and Commercialization Council in June, 2005 based upon their progress to date.

A brief description of each of the Centers is as follows:

Center for Accelerated Applications at the Nanoscale – SDSMT Department of Materials and Metallurgical Engineering, SDSU Department of Electrical Engineering – The industrial impact of nanotechnology is projected to be in excess of \$1 trillion annually within the next 10-15 years. This represents an enormous economic opportunity for the state of South Dakota. Under Governor Mike Rounds' 2010 Initiative for Economic Development, a group of distinguished South Dakota researchers have joined together in a focused effort to conduct applied research and development relating to nano-science and engineering. The programs are chosen for their strong commercialization potential and mutual interest to private sector partners. The Center is positioned to utilize student resources in these programs and is closely associated with the Ph.D. program in nano-science and engineering that has been established at the South Dakota School of Mines and Technology (SDSM&T).

Center for Infectious Disease Research and Vaccinology – SDSU Department of Veterinary Science, USD School of Medicine – The CIDRV was established to foster research activities that will lead to the development of novel therapeutic and diagnostic technologies and products for infectious disease in humans and domestic animals. Substantial progress has been made during the initial year in establishing a research center that is an economic asset to South Dakota, and able to be financially independent by July of 2009. Major advances made during the first fiscal year include; 1) Largely completing the plan for substantial expansion of research capacity through recruitment of highly qualified scientists and technical staff, 2) Enhancing grant and contract writing and receipt activity, 3) Making several discoveries of significant economic potential, 4) Establishing relationships with industry that have, or likely will soon yield revenue and economic impacts, and 5) Organizing an international scientific meeting to be held in South Dakota that will enhance the stature of the Center and provide additional opportunities for collaboration with scientists and economic interaction with industry.

Center for the Research and Development of Light-Activated Materials – USD Department of Chemistry, SDSU Department of Chemistry, Avera Research Institute – Researchers from USD, SDSU and the Avera Research Institute have teamed together to form the 2010 Center that is funded through Governor Rounds' 2010 Initiative. The primary objective of the CRDLM is to enhance the development of a technology-based economy in South Dakota. This economy will, in turn, lead to the creation of high quality jobs and the retention of South Dakota's greatest asset, our people. The CRDLM will contribute to this economy by developing products used in the

medical device and therapy, chemical sensing, and materials markets. Light is the unifying theme in this diverse array of products.

South Dakota Signal Transduction Center – USDSM Cardiovascular Research Institute – Cardiovascular disease and cancer are the most frequent causes of morbidity and mortality in Western societies. A large component of contemporary biomedical research focuses on the cellular and tissue communications collectively referred to as signal transduction pathways that regulate cell growth and differentiation, programmed cell death (apoptosis), response to stress, and the maintenance of homeostasis. The Signal Transduction Center will focus its research on signal transduction pathway alterations in cardiovascular disease and cancer and will organize a critical mass of researchers, develop the infrastructure, and produce the necessary preliminary data to successfully compete for grant support from the NIH and private health agencies.

Specific performance expectations were established for each of the Centers according to the following outline:

1. Economic metrics: a.) External Grant income, and b.) Patents, Licenses, copyrights, etc.

Performance Goals: a.) Generate external resources that provide for a doubling of resources for the Research Center [unit, institute, etc.] by year 6, and b.) By the end of year 5 have produced at least one patent, copyright, etc. that has economic potential for commercialization.

2. Support metrics: a.) Salaries paid by external sources, and b.) Graduate student support/fellowships supported by external sources

Performance Goals: a.) By year 6 have external resources that provide for the salaries of researchers in the unit, and b) By year 6 support all graduate students researchers with revenues from external sources.

3. Reputational Metrics: Articles published in scientific journals

Performance Goals: Publish the equivalent of one article a year in scientific journals for each faculty researcher in the unit.

In October, the Board of Regents heard reports from the four Center Principal Investigators on their first 16 months of activity. The total value of grants awarded to the Centers exceeded \$14.7M with another \$15.2M in grant applications pending. The Centers are providing substantial economic impact for the state investment of \$5.4M during FY05 and FY06 to date.

Among the highlights reported by the 2010 Initiative Research Centers were:

- 1) A cooperative agreement between the Center for Accelerated Applications at the Nanoscale and Zyvex Corp. to exclusively provide integrated circuit testing to the semi-conductor industry.

- 2) Development of a genetically engineered porcine virus replica by the Center for Infectious Disease Research and Vaccinology opens the door to a new generation of vaccines using reverse genetics.
- 3) Work on tissue glues by the Center for the Research and Development of Light-Activated Materials will provide physicians with an alternative to staples and stitches in closing wounds and drawing tissues together.
- 4) Grant support from the National Institutes of Health and private health agencies is funding research by the South Dakota Signal Transduction Center in cell growth and differentiation in four projects is opening up new avenues to combat cardiovascular disease and cancer.

The Centers expect to achieve a self-sustaining condition by Year 6 of the Initiative by generating increasing amounts of external funding equal to or greater than the amount of 2010 funds they receive.

The individual Center FY06 – To Date Project Matrices Reports are as follows:

Center for Accelerated Applications at the Nanoscale, Dr. Shawn Decker, SDSMT, Principal Investigator, Co-Principal Investigators Dr. David Gallipeau, SDSU and Dr. Jon Kellar, SDSMT – This Center focuses on research in the areas of nanoparticles and nanosensors. Ten grants and contracts totaling over \$12M have been submitted and \$252,000 has been received for an NSF major research instrumentation grant. Dr. Gallipeau successfully collaborated with Midwest Microtech, a Brookings company, to obtain a \$100,000 NSF Phase I STTR project and will be submitting a \$500,000 Phase II application in January 2006. An additional \$4.1M of grants are in preparation. One new technician and four new graduate students, at competitive stipends, have been brought into the Center. Three refereed journal articles have been submitted and four articles have been published in proceedings of national meetings. Fourteen presentations at national and international meetings have been made by Center staff. One graduate program thesis was completed in the Center's program. Two patent applications are in progress; four disclosures are in progress; two non-disclosure agreements, two material transfer agreements and one cooperative agreement have been signed. The Center is making progress in reducing the percentage of the total Center budget provided by 2010 funds. The project was actually initiated in December, 2004 with the arrival of Dr. Shawn Decker as PI. The Nanoscience and Nanoengineering Ph.D. program has been established at SDSMT and is very complementary to the Center's goals and objectives. The Center and The Center for the Research and Development of Light Activated Materials at USD have joined together in the state's EPSCoR submission to form a photo-activated nanoscale systems (PANS) project that should prove to be very competitive.

Center for Infectious Disease Research and Vaccinology – Dr. David Francis, SDSU, Principal Investigator with 20 Co-Principal Investigators at SDSU and USDSM – This Center fosters research leading to the development of novel therapeutic and diagnostic technologies and products for infectious diseases in humans and animals. Nine grants and contracts totaling \$1.45M have been received with 19 grants worth \$5.3M pending and 5 grants equaling \$3.0M in preparation. The Center has collaborated

with private sector companies to successfully compete for three Department of Defense Phase I and a Phase II SBIR/STTR projects resulting in \$1.1 million in research funding. Three new senior staff, six technical staff and two graduate students, at very competitive stipends, have been brought in to the Center in FY06. Center staff has published 10 refereed papers, have three refereed papers in press and two papers accepted for publication. Ten additional papers have been submitted for review. Three invited presentations were made including one in Germany. Twenty-nine presentations on Center research activities by Center staff have been made to date. Two patent disclosures were filed during fall 2005. To date over 25% of the funding for the Center's activities is coming from non-2010 Initiative Funds.

Center for the Research and Development of Light-Activated Materials – Dr. Daniel Engebretson, USD, Principal Investigator, with four Co-Principal Investigators at Avera Research Institute, SDSU and USD – The Center performs both basic and developmental research on materials with light activated properties. This research is important to medical applications such as human tissue bonding, drug delivery, and anti-tumor agents and is important to developing phosphors for sensors, new laser materials and thin films that impart special properties and characteristics to the materials that they coat. Six grants totaling \$9.8M are pending. This includes the \$9M PANS joint project with SDSMT. Grants awarded totaled \$3.1M with NSF funding for a Northern Plains Undergraduate Research Center for \$3M being a notable achievement. Nine grants totaling \$1.6M are in preparation. No new personnel have been added to the Center to date in FY06. Ten papers have been submitted to refereed journals by Center staff, one article is in-press and three articles have been published. Four presentations have been made with three of those by invitation. One patent application is in preparation and a non-disclosure agreement with a major ophthalmic industry company has been signed. The Center partners have signed a licensing agreement with PhotoBioMed, Inc. the winner of the Giant Vision Business plan competition in April 2005. To date, over 37% of the funding for the Center's activities is coming from non-2010 funds.

South Dakota Signal Transduction Center, Drs. Benjamin Perryman and Martin Gerdes, Co-Principal Investigators – The Center examines the pathways that regulate cell growth and differentiation, cell death, response to stress and the maintenance of constant physiological conditions. The Center's grant and contracts revenue for FY06 is projected to be \$6.1M. This includes 1 grant received for \$100,476, 7 grants pending for \$8 M and 11 grants in preparation for \$8.6M. Two new personnel have been added to the Center's staff in FY06. Eleven refereed journal articles have been submitted, one has been accepted and six have been published. Fifteen national and international presentations have been made with two being invited presentations. No disclosures have been made or are in progress in FY06. In FY05 the \$1 M of 2010 investment in the center generated \$7.4 M external research funds and that is projected to increase to \$10.93 million by 2009.

Quantitative Expectations for External Funding and Commercialization
February 15, 2006

Research and Commercialization Program

The objective of the program is to increase research and development activities at the 2010 Research Centers and maximize the economic impact in the state of South Dakota through commercialization of the research results and building research industry clusters. This will be done by (1) replacing 2010 Center funding with external support by year six, (2) creating research job opportunities in the Centers supported by external funding, (3) collaborating with industry partners to conduct applied research and commercialize research results, (4) spin off start-up companies, (5) attract technology based businesses from other states, and (6) generate royalty revenues for Center generated intellectual property.

2010 Research Centers Funding

Fiscal Year	State 2010 Research Funding (\$M)*	External 2010 Research Funding Awarded (\$M)**	Total 2010 Research Funding (\$M)	External 2010 Research Funding Pending (\$M)
2005/2006 Actual to 10/06	5.4	14.7	20.1	15.2
2007 Projected	2.7	TBD	TBD	TBD
2008 Projected	2.7	TBD	TBD	TBD
2009 Projected	2.7	TBD	TBD	TBD
2010 Projected	0	TBD	TBD	TBD
Total to Date:	13.5	14.7	28.2	15.2

* Includes \$2.7M state appropriation for 2010 Research Centers.

** The total value of grants awarded to the Centers as of 10/06 with another \$15.2M in grant applications pending. These grants usually run over a three to five year period. Industry share also reported here.

Major External Research Funding Awards

- Center for Accelerated Applications at the Nanoscale, (CAAN) received a \$250K grant from NSF to purchase a specialized scanning electron microscope to support the nanoscience research initiative.
- Center for Infectious Disease Research & Vaccinology, (CIDRV) received a \$460K grant from USDA to work with E. coli vaccines.
- Center for Infectious Disease Research & Vaccinology, (CIDRV) (Ying Fang) has received \$333K in grants to support her as a new investigator in infectious disease research.

- Center for the Research and Development of Light-Activated Materials, (CRDLAM) received \$3M from the NSF to establish a Northern Plains Undergraduate Research Center. This is a major achievement and will help establish the CRDLAM as a premier provider of undergraduate research experience, thereby creating a pipeline of talented students for the System's graduate programs.
- South Dakota Signal Transduction Center, (SDSTC) received an American Heart Association grant for \$100K to support signal transduction research.
- The Center for Accelerated Applications at the Nanoscale, (CAAN) and Center for the Research and Development of Light-Activated Materials, (CRDLAM) have joined together in the State's NSF EPSCoR submission to form a Photo-Activated Nanoscience Systems (PANS) project. This grant has been recommended for funding at the \$6.75 million level over three years, providing over \$4.5M in funding for the 2010 Research Centers from NSF.

2010 Research Centers Commercial Report

Fiscal Year	University/Industry Research Collaboration (\$M)*	Spinoff/Startup Companies (\$M)	Business Relocation (\$M)	Royalty Income (\$M)
2005/2006 Actual to 10/06	1.8	0.50	0	0
2007 Projected	0.25	TBD	TBD	TBD
2008 Projected	0.25	TBD	TBD	TBD
2009 Projected	0.25	TBD	TBD	TBD
2010 Projected		TBD	TBD	TBD
Total to Date:	2.55	0.50	0	0

* University share also reported here.

Major University/Industry Research Collaborations

- Avera Research Institute, Sioux Falls, SD has committed \$250,000 annually to the 2010 Center for Light-Activated Materials.
- Infectious Disease 2010 Center & Rural Technology Inc., Brookings, SD, \$850,000 DoD Phase I & II STTR Projects & \$100,000 DoD Phase I STTR
- Infectious Disease 2010 Center & Chronix Biomedical, San Jose, CA (considering relocating to SD), \$100,000 DoD Phase I SBIR
- Center for Advanced Applications at the Nanoscale (SDSU) & Midwest Microtech Inc., Brookings, SD, \$100,000 NSF STTR project.

Spinoff/Startup Companies

- Nanoscale Testing Services, Rapid City, received a \$250,000 loan from the Rapid City Economic Development Fund matched by \$250,000 in Future Funds.

